CUTEC News

RAW MATERIAL SOURCES FOR TOMORROW

EDITORIAL

INDUSTRY 4.0 – WE'RE PART OF IT!

Dear Reader,

Journals in the fields of automation, expert systems, or merely data analysis, are nowadays fully of concepts such as "cyber-physical systems", the "Internet of Things" and "Industry 4.0" (also known, among other things, as Smart Manufacturing). What is actually behind the German Federal Government's high-tech strategy, and what are implications of the associated digital agenda for organisations like the CUTEC Institute?

In order to answer that question, we need to consider what the actual goal of the so-called fourth industrial revolution is: freeing up data from merely being stored on computer, so it can be analysed – as far as possible online; the functionality and efficiency of connected machinery and processes can be classified; maintenance personnel can be alerted as appropriate; and the need for improvement can be identified in operation. Some companies might well say: "We've always being doing that; what added value does "Industry 4.0" bring? What's new about it?" The answer is revealed when we consider common operational processes, in which sensor data is indeed recorded online, and often visualised in a problem-solving way: Over time those processes generate huge amounts of data, so that even highly trained personnel are quickly overwhelmed when it comes to actually analysing their processes. This is particularly so, for example, in attempting to differentiate between fault conditions and age-related changes in machinery, or fluctuations in the production process linked to differing batches.

This is exactly what "Industry 4.0" offers: the facility to develop intelligent – that is, expert-based – routines which are capable of revealing data irregularities in a process of dialogue with the human operators, of then learning autonomously from that dialogue, and so expanding their expert knowledge so as to reveal irregularities in previously unidentified process interactions in an ever more targeted way over time. It is exactly that adaptive data processing capability that is key to preventive maintenance, involving a wide range of different procedures, optimisation of sensors, or upgrading of the production process itself. I think it was most accurately formulated by a plant manager who said: "I want to peer into a crystal ball so as to buy time; to keep my production running until maintenance really makes sense – that is to say, until it is absolutely essential."

But to reiterate the question: What does that mean specifically for organisations such as the CUTEC Institute, which sees itself as an interface between basic research and practical innovation in methods, processes and procedures? And will the CUTEC Institute be able to make any substantial contribution at all in the field described? The answer is a simple "Yes": Its multi-disciplinary staff has already translated innovative techniques and methods into practical applications in the fields of process automation, material life cycle analysis and adaptive expert systems, and has above all acquired the inter-disciplinary know-how which is essential to the implementation of "Industry 4.0" in computing terms. The often questioned diversity of different disciplines among the CUTEC Institute's experts is thus ideally suited to handling "Industry 4.0" projects of such a kind. In fact, considering the list of projects completed by the Institute it can justifiably be claimed that CUTEC has been working on "Industry 4.0" for years.

So, in looking forward to further innovative projects and cooperation agreements in future, we continue to forge ahead.

Best regards,

Matthias Reuter
(Head of the Department of Adaptive Systems)

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THE RECYCLING CHAMPIONS' LEAGUE
STATE GOVERNOR STEPHAN WEIL VISITS REWITA

"It's the Recycling Champions' League," asserted Governor of the State of Lower Saxony Stephan Weil in outlining the goals of the German Federal Ministry of Education and Research (BMBF) sponsored r⁴ "REWITA" project to recover significant quantities of indium and other industrially key strategic raw materials from the ponds of the former ore mine in Rammelsberg.

And the project stakeholders – the Technical University of Clausthal, industrial partners and the CUTEC Institute as the coordinator – intend to battle their way into the final of the "Champions' League". The journey to that end is being followed with great interest on an international scale. Numerous enquiries have already been received, from as far away as Australia, demonstrating the importance of the project for comparable secondary deposit sites worldwide. "When can we schedule the commissioning?" was the question Governor Weil asked on his summer trip to the site. Professor Daniel Goldmann from the Technical University of Clausthal's Institute for Mineral Processing replied that seven to 10 years would be a realistic timeframe. As he pointed out, it will not only mean ensuring that everything is technically right, but also that all legal issues have been settled. On the current state of affairs, Professor Goldmann commented: "We started on the basis of a forecast, and we are getting close to an initial extrapolation."

Stephan Weil – who was accompanied on his trip by state parliamentarians Petra Emmerich-Kopatsch and Alexander Saipa – described the realisation of the project as a "win-win" for all sides, given that it will also result in the remediation of a polluted site. Things could only get better, he asserted, as everything about it was right: in terms of environmental policy, regional development, and the recovery of valuable raw material commodities. (bt)

CUTEC engineer Andre Bertram (Dipl.-Ing.), part of the r⁴ INTRA team, hands the flyer on the BMBF-sponsored r⁴ project to interested State Governor Stephan Weil (right)

SPD FACTION LEADER THOMAS OPPERMANN VISITS HTMET

SPD faction leader Thomas Oppermann and a large group of journalists were welcomed to the "Lautenthals Glück" mining museum in the Oberharz region.

On their visit, they found out all about the aims of the "r⁴" programme sponsored by the German Federal Ministry of Education and Research (BMBF) in safeguarding the supply of strategically key raw materials for Germany's high-tech industry of the future. The "HTMET" project is recording the as yet unused potential for the recovery of rare metals in the traditional mining areas in the state, such as the Harz mountains, based on sampling and collected materials. The data gathered will be used to create a land-use register. "It's tremendously exciting; a thoroughly useful project, and offering great prospects for the Harz region too," said Thomas Oppermann.

All aboard the underground train: Dr. Torsten Graupner (BGR), Thomas Oppermann and Dr. Torsten Zeller (CUTEC), (left to right)

Dr. Torsten Zeller stresses the importance of the r⁴ programme

HTMET is an acronym standing for "metals in German sulphidic non-ferrous metal ores relevant for high-tech applications – Estimation of resource potential". The material being investigated in terms of its rare metal content in Lautenthal is zinc blende.

"In some areas of the Black Forest zinc blende is very rich in germanium; here it contains more gallium," explained project coordinator Dr. Torsten Graupner from the Federal Institute for Geosciences and Natural Resources (BGR) in Hanover. It is participating in the project alongside the CUTEC Institute, the Technical University of Clausthal, Recylex GmbH Goslar, and the Montanuniversität Leoben in Austria. "The results will be available by the end of 2018," reports Dr. Graupner.

"These are not ivory-tower projects. We need assured supplies of raw materials," stresses CUTEC's Dr. Torsten Zeller, on behalf of the "r⁴ INTRA" integration and transfer project accompanying the research activities. Partners from science and industry are working together on 40 r⁴ joint projects throughout Germany. The technologies being developed are in demand and applicable worldwide, as Dr. Zeller asserts.

Silver-containing lead ores, zinc and copper ores have been mined in the Oberharz region for centuries. "Lautenthal was the second largest zinc deposit site in the Oberharz", explains mineralogist Dr. Wilfried Ließmann from the Technical University of Clausthal. "And we still have potential to utilise in the Harz. Deeper down there are still substantial quantities of zinc blende, which might well contain rare metals. It all depends on whether the quantities are viable to mine." (bt)

ELEXSA

Today's ash and slag as raw material sources for tomorrow

More than six million tonnes of ash, slag and dust are produced every year in industrial processes and in waste incineration in Germany alone. What all those materials have in common is high levels of valuable and rare metal content for which there is high demand in industry. Recovering those strategically key resources would enable German manufacturers to be competitive without being reliant on raw material sources from outside Europe. As part of the "ELEXSA" project (electro-dynamic fragmentation of slag and ash with subsequent hydrothermal extraction of industrially key strategic raw materials from the slag/ash fine fractions) sponsored by the German Federal Ministry of Education and Research (BMBF), the CUTEC Institute together with industrial and scientific partners is researching into efficient recovery methods.

The fine fractions of the ash, slag and dust frequently contain metals such as antimony, tin, molybdenum, tungsten, cobalt and rare earth metals (REMs), which in view of their limited availability are classified by the EU as critical raw materials. The residues and by-products from manufacturing plants thus offer major potential for value creation in serving current and future demand from industry. This was also documented in a report published by the German Federal Environmental Agency in 2010. Fast-growing sectors such as aerospace and energy technology, in particular, as well as high-tech manufacturers of smartphones, catalytic converters and medical product for example, are reliant on rare earth metals.

This is the focus of the "ELEXSA" project. Its aim is to develop an innovative processing chain by June 2019, and to optimise it for the individual target materials. The process will be implemented in three stages.

There are currently no noteworthy recycling concepts for the fine fractions of the subject materials, as current processing techniques are oriented almost exclusively to coarser materials. First, the supplied materials are selectively separated by means of electro-dynamic fragmentation (EDF). In this, multi-component systems are selectively broken down into their individual constituents by means of ultra-short underwater high-tension pulses, followed by separation of the fine material. In earlier projects, the Fraunhofer Institute for Building Physics (IBP) was able to show that recycling rates can be significantly increased by prior electro-dynamic fragmentation.

The fine fraction obtained is fed into a reaction autoclave in order to break down and extract the in part not readily soluble metals. Exactly set process parameters such as pressure, pH value and temperature are key to high efficiency.

In the third step, the dissolved metals are selectively recovered. The researchers are analysing the non-reusable residues with regard to their environmental compatibility, so as to enable their safe landfill storage.

Based on the successful combination of the various processing steps, "ELEXSA" seeks to create a high-efficiency recycling method to effectively recover industrially key strategic raw materials.

Photo: Ralf Perret

Slag is seen as a raw material source for industrially key strategic metals

The slag material will be chemically analysed in the lab

The "ELEXSA" project is being funded by the German Federal Ministry of Education and Research (BMBF) with 1,115 million Euros under the auspices of the "r⁴" programme (Innovative technologies for resource efficiency – Research for the provision of industrially key strategic raw materials) within the framework FONA (Research for sustainable development) programme.

Six scientific and industrial partners are working together to attain the project goals. The Fraunhofer IBP in Holzkirchen has assumed the lead role. Scientists have already been researching into electro-dynamic fragmentation, including process water analysis, for many years. The Department of Mineralogy at the Ludwig Maximilians University in Munich will be conducting all the experiments for material separation and selective recovery of the target metals. The CUTEC Institute, headed by its Department of Resource Technology, will produce a synthetic slag from electronic scrap in order to determine the efficiency of the process for that material category. It will also be conducting most of the analysis of the input materials and of the recovered products. The necessary working materials are being supplied by Simet GmbH, Thyssenkrupp Mill-Services & Systems GmbH, and the city of Hamburg's municipal cleaning department.

(di)

DEVELOPMENT OF INNOVATIVE RESOURCE-CONSERVING UNDERGROUND IRRIGATION SYSTEMS

Water is a scarce resource, particularly on an international scale. The amount of water available per person is steadily declining as the global population grows by more than 60 million a year, and as a consequence of climate change. This is leading to extreme scarcity of water in increasing numbers of regions around the world. The largest current user of water resources – accounting for some 70 % of global consumption – is agriculture. Moreover, in regions where water is scarce especially, irrigation systems are often used to ensure adequate yields of agricultural crops.

Global sales of irrigation systems are set to grow rapidly over the coming years. According to a report prepared by consultants Roland Berger for the 2012 G20 summit, annual investment demand for irrigation systems in the developing countries of Africa, Asia and Latin America is estimated at 38 billion US Dollars. In Europe, too, increasing water shortages in some countries, such as Spain and Greece, are leading to a sharp rise in demand for new irrigation technology in order to safeguard food production.

Date palm watering test in the Tozeur region of Tunisia

These are the issues being confronted by the Department of Waste Water Process Engineering's development project recently approved by VDI-ZIM. With funding from the German Federal Ministry for Economic Affairs and Energy, an innovative underground membrane hose and the associated irrigation system will be developed in cooperation with the company Ecopolymer Membrane Technologies GmbH.

Watering by a perl hose

Underground systems do already exist. The advantage of them is that they use as much as 70 % less water than conventional irrigation systems. They are thus a highly useful means of conserving resources. Another advantage of underground irrigation systems is that they avoid surface salination due to evaporation of irrigation water. A third resource-conserving aspect of the joint development project is that it employs recycled materials, and will also assure recyclability of the new product.

Currently available systems are already reaching their technological limits in terms of their ability to meet future requirements for the efficiency of water distribution and maintaining soil fertility, so this project is targeting a massive product quality leap.

To that end, methods and processes will first be developed to test the watering qualities of the hoses in a reproducible manner. In the second step, correlations between the production process and quality parameters will be identified and utilised to achieve the specified quality improvement of the hoses and of the irrigation system. In the third step, an automation method for the production process will be developed. The new products and the associated irrigation system will finally be field-tested in the watering of crops such as olive trees, coconut palms, etc.

Linear water discharge

The product optimisation being developed might also be of interest to Germany, as many areas of the country are already being watered by sprinkler systems, and increasing dry periods are also to be expected here as a result of climate change. (si)

Olive grove watering test field in the Kairouan region of Tunisia

LOWER SAXONY ENERGY SCENARIOS REPORT PUBLISHED

On April 20th the report "Scenarios for energy supply in Lower Saxony in the year 2050" prepared under the leadership of the CUTEC Institute was presented at a press conference by Environment Minister Stefan Wenzel.

The report sets out the development towards a scenario of 100 % energy supply from renewables. The stated aim is to achieve a needs-based energy supply to consumers, taking into account consideration of environmental compatibility, economic viability and security of supply. Based on that initial scenario, a second scenario is developed subject to the condition of a 80 % reduction in greenhouse gas emissions relative to the reference year 1990.

For each scenario, a consistent aim is first set forth, describing a technically feasible state of energy supply and consumption in 2050. Interim targets are set out at 10-yearly intervals over the coming years on the way to the target state in 2050. This method ("back casting") is thus contrary to other scenario methods, which continually update the current trends towards increasing renewables in the form of forecasts.

The methods underlying the presented scenarios cover future consumption needs based on various renewable energy sources. Alongside conventional electricity sector, the areas of heat, power and primary materials in various consumer sectors, such asdomestic, light industrial/trade/services, industry and transport consumption sectors, are also considered in the report and switched to renewable energies.

The assumptions regarding energy production are based on the existing potential in the state of Lower Saxony. This is done in consideration of the land requirements associated with the respective technology, taking into account potential competing usages. This ensures that the energy volumes calculated for 2050 are in fact technically feasible and combinable.

The report also shows, that further analysis are required in order to assess energy scenarios across a broader time scale, particularly in order to analyse the future short- and long-term storage requirements. A consortium led by the CUTEC Institute was commissioned by the Lower Saxony Ministry of the Environment, Energy and Climate Protection to conduct the relevant study. The scenarios devised to date will be further supplemented by more detailsd in cooperation with the Lower Saxony Energy Research Centre (EFZN), the Hameln Institute for Solar Energy Research (ISFH) and the LiFE 2050 energy research cluster at the Leibniz University in Hanover. (zh)

REVIEW
CUTEC 2016 SUMMER FESTIVAL

A scientific symposium on the current hot topic of "Industry 4.0" (otherwise known as Smart Manufacturing) opened the CUTEC Institute's Summer Festival in June, attended by large numbers of guests.

In his address, Hartmut Schaper, Legal Counsel in the Industrial and Technology Policy section of the Lower Saxony State Economy Ministry, described digitisation as the "fourth industrial revolution", following on from the age of steam, the conveyor belt, and automation. He asserted that, in order to utilise the new possibilities on an industrial scale, small and medium-sized companies would also need employees who are familiar with digital technology. He underlined that there was a need for state aid in achieving those ends.

As Schaper pointed out: "Institutions operating at the interface between industry and science, such as the long-standing and respected CUTEC Institute, are of vital importance to the economy of Lower Saxony." Following the symposium, CUTEC offered guided tours of its pilot plant facilities. The tour ended in the Institute's courtyard area, where catering was provided and visitors had the opportunity to chat and engage in scientific dialogue with CUTEC staff in a relaxed, convivial ambience. A jazz combo from Hanover provided the musical accompaniment. (bt)

After the symposium and the guided tours, there was a convivial gathering in the CUTEC Institute's courtyard area

Save the Date

Workshop on microbial fuel and electrolysis cells

Bio-electrochemical sewage treatment technology can help turn a treatment plant from the area's biggest municipal electricity consumer into a power producer. There are as yet no technical systems anywhere in the world capable of achieving that, however. The greatest advances are being made by the first semi-technical pilot plant in Germany, which was developed under the leadership of CUTEC (project coordinator: Professor Sievers). A presentation on the pilot plant is being made on November 21st in a workshop at the EURAWASSER treatment plant in Goslar. The aim of the workshop is to enable knowledge transfer between researchers and developers, operators of treatment plants, plant planners and manufacturing industry, in order to support the ongoing development and future application of the new technology. Interested parties are cordially invited to attend. To book a place, for a small fee of 50 Euros, visit:https://bmbf.nawam-erwas.de/de/anmeldung-zum-workshop-mikrobielle-bz (si)

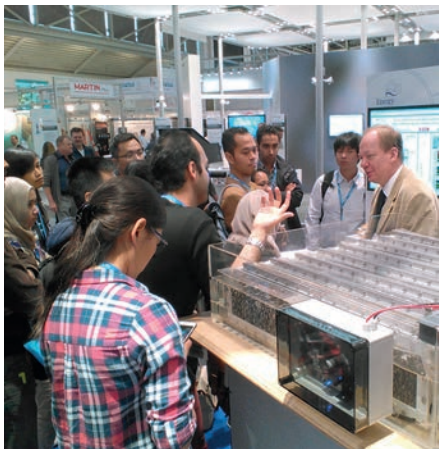
REVIEW OF IFAT 2016

CUTEC represented with two stands at the world's leading environmental technology fair

IFAT, the world's leading trade fair for the water, waste water, waste and raw materials management industry, was held in Munich from May 30th to June 3rd 2016. Approximately 138,000 visitors from more than 170 countries attended this year's milestone event. The renewed rise in the numbers of visitors and exhibitors relative to 2014 is further proof of how the IFAT fair has been influencing developments in environmental technology for 50 years now.

The CUTEC Institute also utilised this key trade fair to make lots of new contacts and meet up with long-standing customers and business partners.

BMBF JOINT STAND IN HALL A5



Lots of attention for the bio-electrochemical fuel cell model

The German Federal Ministry of Education and Research (BMBF) presented selected examples from its "NaWaM" (Sustainable water management) sponsorship programme on its stand. The keynote topic was the green economy – a sustainable way of doing business which is both environmentally and socially sustainable, as well as competitive. Innovative ideas for efficient water resources management ("Blue Innovations") were presented. They aim to counter the expected drastic decline in global water supplies in future.

Among the selected projects was the "BioBZ" joint project under the auspices of the BMBF's "ERWAS" programme (Future-proof technologies for energy-efficient water resources management), led by the CUTEC Institute's Department of Waste Water Process Engineering (coordinator: Prof. Michael Sievers). The subject of this project involving six scientific and industrial partners is the development, investigation and evaluation of the bio-electrochemical fuel cell as a building block of a power-producing sewage treatment plant up to pilot scale.

In order to demonstrate how such a bio-electrochemical fuel cell works, CUTEC created a dedicated model specially for the fair, incorporating real electricity production in operation during the event. Another attraction was a so-called Inscope telescope, which provided an interactive insight into the fruits of state-of-the-art water research and, in particular, the functionality of the bio-electrochemical fuel cell.

The project presentation was much admired by visitors, and resulted in many interesting discussions with experts from companies, professional bodies and research institutes, as well as the establishment of new contacts. (bo)

RETECH JOINT STAND IN HALL B2

The dull, repetitive drone of waste presses of all kinds; a busy to-and-fro of visitors from all over the world, most of them carrying a promotional backpack or bag – welcome to hall B2! The joint stand hosted by RETech in the hall also has lots to offer visually, with drying processes demonstrated on banana skins, and odour filters built-in to organic waste bins.

Interested visitors on the CUTEC stand in hall B2

German RETech Partnership brings together businesses and institutions in the waste management and recycling sector – from collection and logistics, through treatment, to marketing, consulting, planning, research and academic teaching – under a single umbrella. The aims of the organisation include improving export chances, promoting know-how transfer, and building a network.

The CUTEC Institute is part of that network, and exhibited both its hardware and software at the event alongside three partners. The models of plants from the Department of Thermal Processes attracted plenty of interest. Some of the visitors also enjoyed an interactive media presentation setting forth the diversity of tasks and activities undertaken by the CUTEC Institute.

The core of our showing, however, was the poster presentation of two successful in-house projects:

- The project titled "Eco-friendly utilisation of non-established material flows in waste incineration plants in the year 2025" presents a preview of the future capacity utilisation levels of waste incineration plants. The trend, based on population factors and use of previously ignored material flows, is shown to be stable through to 2025, with positive life-cycle assessments.
- The accompanying "r⁴ INTRA" integration and transfer project led by the Department of Metal Recycling is revealing potential for synergy based on the interlinking of individual joint projects which would not otherwise be identifiable.

Numerous interesting conversations were held, and many opportunities arose for networking and establishing new contacts.

We would like to thank all who visited our stands, and look forward to seeing you again soon at one of our upcoming events. (fi)

CUTEC ON THE ROAD

6TH WASTE AND RESOURCE MANAGEMENT CONFERENCE IN BERLIN

Group photo of the attendees in front of the main building at the TU Berlin

The 6th Waste and Resource Management Conference hosted by the German Association for Waste Management (DGAW e.V.) was held at the Technical University of Berlin on March 10th and 11th, 2016.

Over the course of two highly interesting days, young scientists from Germany and Austria presented the results of their doctoral work. The conference was divided into six subject areas:

1. Material flows
2. Recycling I
3. Biological processes I
4. Thermal processes
5. Recycling II
6. Biological processes II

In part 4, "Thermal processes", Elena Fedianina (Dipl.-Ing.) from the Department of Thermal Processes, presented a paper on the current standing of her doctoral thesis titled "Safeguarding German waste incineration plant sites". The doctoral candidates' presentations and posters generated lots of dialogue in the course of the event. At the end of the conference, a vote was taken on the best presentation and best poster, and the DGAW announced its grant awards.

The conference was very well attended, meaning there was plenty of opportunity for interchange between the young scientists, professors, and other specialists in the field.

In advance of the conference, on March 9th, an excursion was made to the biogas plant in Ruhleben. The excursion, all the presentations and the scientific dialogue undertaken clearly showed how important, interesting and extensive the field of waste management really is. (fed)

ASIA CLEAN ENERGY FORUM 2016 IN MANILA

The Asian Development Bank (ADB) hosts an annual Clean Energy conference in Asia in cooperation with the US development service USAID and other organisations. The 11th annual conference was held between June 6th and 10th in Manila in the Philippines. This year's topics were energy efficiency, renewable energy, access to energy, and future clean energy for Asia. Around 1,500 registered visitors attended the conference, which featured some 250 presentations on the premises of ADB.

Dr.-Ing. Werner Siemers from the CUTEC Institute participated as invited speaker in a session on renewables (session 6: Scaling up renewable energy deployment). On June 9th he presented his paper titled "Scenario Development for a 100 % Renewable Future", backed by the results of the report on "Scenarios for energy supply in Lower Saxony in the year 2050" prepared for the state of Lower Saxony. In discussions directly after his presentation, and over the following days, he was frequently approached on the subject. The vision of 100 % renewable energy supply is apparently still new in Asia. At present the questions are about how – and how much – renewable energy can be integrated into the existing system. There is no discussion of completely replacing fossil fuels. Consequently, the presentation was able to convey some valuable ideas.

The conference also provided opportunities for dialogue with potential partners in Asia. High-ranking politicians and industry leaders were in attendance. (sie)

Dr.-Ing. Werner Siemers during his presentation

OPEN DAY AT THE GOSLAR SEWAGE TREATMENT PLANT

The Open Day at the municipal sewage treatment plant in Goslar on Saturday August 20th, 2016 attracted lots of visitors. The event was organised to mark this year's 20th anniversary of the cooperation between the Goslar municipal sewage corporation SGG and the plant operating company EURAWASSER Betriebsführungsgesellschaft mbH.

In addition to guided tours of the site, visitors also had the chance to find out all about the CUTEC Institute's current "BioBZ" bio-electrochemical fuel cell research project in a specially installed experimental container. In the joint project sponsored by the German Federal Ministry of Education and Research (BMBF), CUTEC and it scientific and industrial partners is investigating possibilities for the technical implementation of electric power generation from sewage component materials by means of biological fuel cell systems.

View into the bio-electrochemical fuel cell experimental container

A small fuel cell installation run with sewage from the Goslar treatment plant naturally attracted lots of visitors to the container, where CUTEC staff were on hand to explain how the ground-breaking technology works and answer the many questions asked. The exhibit is in fact merely a foretaste of a planned pilot plant which is scheduled to launch at the Goslar treatment plant by the end of the year. (bo)

SCIENTIFIC ADVISORY BOARD

Profile in this issue: Professor Dr.-Ing. Rolf Brendel

Prof. Dr.-Ing. Rolf Brendel

In addition to 13 universities and 16 academies of applied sciences (Fachhochschulen), the state of Lower Saxony is also home to many extramural research bodies. Through all those institutions, the state promotes close cooperation between the scientific and industrial spheres, and supports high-level interdisciplinary work. Companies based in the region and young scientists benefit from such cooperation opportunities and research projects. This enables impressive, goal-oriented scientific results to be achieved. Institutions such as the Institute for Solar Energy Research (Institut für Solarenergieforschung GmbH; ISFH) in Hameln and the CUTEC Institute play a major role in this. The two institutions have been linked for quite some time now, through projects in the fields of waste water engineering and renewable energy.

Prof. Dr.-Ing. Rolf Brendel, head of the ISFH and Professor at the Leibniz University in Hanover, thus regards his current membership of the Scientific Advisory Board of the CUTEC Institute also as a means of strengthening common interests and enhancing networking activities: "The shift in global energy use essential to the healthy future of humanity is a huge communal task impacting on very many different levels and dimensions within society. Interdisciplinary cooperation is especially vital to its success. In my work on the Scientific Advisory Board of the CUTEC Institute, I look to contribute my experience in the field of solar energy. The aim must be for volatile renewable energy sources to not only become even more cost-effective, but also to integrate ever more effectively into our energy system and our manufacturing technology. In both areas there are points of intersection with the exciting work of the CUTEC Institute."

Rolf Brendel, born in Grevenbroich in 1961, studied physics and mathematics at the Universities of Freiburg, Sussex (UK) and Heidelberg. After graduating in 1987, he acquired his doctorate at the University of Erlangen-Nuremberg in the field of optical spectroscopy. He subsequently worked at the Max Planck Institute for Solid State Research in Stuttgart, specialising in optical and electrical loss mechanisms in solar cells. In 1997 he was appointed head of the Department of Thermosensor Technology and Photovoltaic Energy of the Bavarian Centre for Applied Energy Research. There he developed new technologies for the production of low-cost solar cells.

In 2002 he became professor of physics at the Friedrich-Alexander University of Erlangen-Nuremberg. In 2004 he took up a professorship at the Leibniz University in Hanover (Institute for Solid State Physics), also becoming scientific director and chief executive of the Institute for Solar Energy Research in Hameln, an associate institution of the Leibniz University of Hanover with some 140 staff.

He holds various offices within the Forschungsverbund Erneuerbare Energien renewable energy research association, and is a member of other scientific bodies. In 2013 he was awarded the Kaiser Friedrich Research Prize for his research into high-efficiency unsawn silicon thin-film solar cells. His areas of scientific specialism include photovoltaic energy, solar power, solar cell simulation, silicon research, and solar energy for buildings. (kra)

NEWS FROM THE CUTEC TEAM

Dipl.-Ing. Dennis Haupt

With effect from June 1st, 2016, a new scientist has joined the CUTEC Institute's Department of Waste Water Process Engineering.

Dennis Haupt studied environmental protection technology at the Technical University of Clausthal, graduating from there in May 2016 with a dissertation on the subject of "Experimental investigations into biological fuel cells".

His role at the CUTEC Institute includes scientific research and work on industrial projects.

Eva Heindorf joined the CUTEC Institute's administration department on August 1st 2016, marking her first step on the career ladder. Over the next three years she will undergo thorough training to qualify as an office administrator. We wish her every success.

Eva Heindorf

Congratulations…

… to our former colleague Sabine Bohlmann, who on June 9th 2016 gained her doctorate (Dr. rer. nat) in the Faculty of Mathematics/Computer Science and Engineering. We wish her all the best in her future scientific career.

… to Jessica Hauck, who has passed her examination to qualify as an office administrator. We would like to take this opportunity to thank her once again for her efforts, and wish her all the best for her future. (wes)

IMPRINT

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